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Regulating Hospital Capital Investment: The Experience in Massachusetts

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Office of Health Research, Statistics, and Technology
National Center for Health Services Research

National Center for Health Services Research
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Abstract

This study examines hospital capital investment among Massachusetts short-term general voluntary hospitals between 1967 and 1976, and assesses the impact of Certificate of Need (CON) regulation. A profile of capital expenditures for fiscal years 1967-1976 was developed from Massachusetts Rate Setting Commission data for 26 sample hospitals, stratified by teaching status and Boston versus non-Boston location. Case studies were conducted in nine sample hospitals to explore the determinants and consequences of major capital projects undertaken by the institution. Enormous capital expansion took place from 1967-76. Hospitals in areas of rapid population growth significantly increased their bed size; other hospitals replaced or modernized inpatient facilities, and expanded ambulatory care capacity. All hospitals significantly expanded their ancillary service capacity. With respect to the impact of CON regulation, the evidence revealed that by 1976 and beyond, CON review had reduced all dimensions of project scale and cost by as much as two-thirds of that originally proposed.

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RESEARCH SUMMARY SERIES

Regulating Hospital Capital Investment: The Experience in Massachusetts

Julianne R. Howell, Ph.D.
University of California, San Diego

March 1981

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Foreword

Broadly speaking, certificate of need laws are grounded on the assumption that a primary reason for spiralling health care costs lies in the existence of duplicative and inappropriate facilities and services. To avoid perpetuating this problem, it is necessary to curtail the construction of new facilities and the provision of new services unless they can be shown to be needed. The rationale for certificate of need is compelling. However, there are many who doubt that the substitution of a regulatory mechanism for an admittedly imperfect market mechanism will improve the situation. On the other hand, it is the failure of the market system, embodied in the so-called "Roemer effect" which posits that the existence of hospital beds creates a demand for them, that certificate of need programs are designed to correct. How well these programs work is still an open question.

This report presents a summary of Ph.D. dissertation research supported by the National Center for Health Services Research. The study examines in detail hospital capital investment undertaken by Massachusetts short term general hospitals between 1967 and 1976. Patterns of capital expansion are compared for teaching versus nonteaching, and for Boston versus nonBoston hospitals, and special emphasis is placed upon assessing the impact of certificate of need legislation. It is hoped that this report will contribute to our understanding of the regulatory process and the reactions of those who are involved.

Gerald Rosenthal, Ph.D.

March 1981

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Introduction

During the past decade the rapid and continuing increase in the costs of medical care has emerged as a major health policy issue at all levels of government. Leading the health care cost spiral has been the acute care hospital sector; expenditures for hospital services constitute the largest portion of total health care spending, 40 percent in recent years, account for more than half of the government share, and since the enactment of Medicare and Medicaid in 1965 have risen almost twice as fast as outlays for other categories of medical care.[1] Most efforts to curb the increase in health care costs have therefore been focused on acute care hospitals.

Analyses by several different investigators have now established that approximately half of the total increase in hospital costs since 1960 has been attributable simply to inflation – that is, to the increase in the wages and prices in the hospital sector that would have been required simply to produce the same level of service over time. The remainder of the increase, however, stems from the inexorable growth in the sophistication of labor and non-labor inputs required to produce the ever more complex services that now comprise a hospital admission or "patient day".[2] Capital expansion – the construction of new facilities, the addition of new beds and services, and the investment in new "equipment-embodied technology" – has long been recognized as one of the major vehicles through which the intensity of hospital care is increased. As a result, the creation of mechanisms to limit capital investment by hospitals, and particularly the enactment of Certificate of Need (CON) regulation, have received early and continuing prominence in state and federal government strategies to contain rising health care costs.[3]

Despite the importance of hospital capital expansion and of Certificate of Need, neither the factors influencing hospital capital investment nor the impacts of CON upon them have been examined in detail. Not even the actual composition and patterns of hospital capital expenditures over time have been de-

termined because the sources of readily available data are too aggregated to reveal any but the most obvious changes in total beds and total investment. Yet an understanding of the nature and determinants of hospital capital expansion is essential to the evaluation of the impacts of current regulatory mechanisms and to the design of more effective strategies to shape future investment.

This study was conducted to fill some of the gaps in current knowledge about hospital investment behavior and its response to regulation. Previous investigations either examined hospital capital expansion or attempted to evaluate the process and outcome of Certificate of Need. By contrast, this study employed a design that combined an in-depth analysis of the amount and composition of capital investment across the whole voluntary hospital industry in one state, both before and after the introduction of CON regulation, with an examination of the implementation of the CON program itself and of the changes in the nature of hospital investment resulting from the presence of CON. Study findings, therefore, offer insights into the dynamics of hospital capital expansion and the impacts of CON that previous work could not provide.

The study focused on short-term general non-government nonprofit (i.e. voluntary) hospitals in Massachusetts over the period Fiscal Years 1967-76, five years prior to the enactment of CON regulation in the Commonwealth on November 15, 1971, and five years following CON implementation, and addressed the following major sets of questions:

- Is there a basic pattern of investment followed by all hospitals or by certain categories of hospitals, such as teaching versus nonteaching institutions? In particular, how frequently does investment in beds occur and is there a relationship between investment in beds and investment in ancillary services?

- What are the incentives, opportunities, and constraints that have governed a hospital's choice of investment projects? Have these determinants varied by type of hospital and/or time period?

- How much of hospital capital expenditure falls under the aegis of CON review and what, therefore, is the potential of this mechanism to limit future capital expenditure?

- What is the lag between the introduction of CON regulation and the time that capital expenditures reviewed by CON first appear in a hospital's asset base? When, therefore, can CON impacts be appropriately examined using "ultimate" outcome

measures focused on the amount and composition of hospital investment? What measures of more "intermediate" outcomes can be used to evaluate CON performance in the interim?

- How have the Certificate of Need program, the prospective reimbursement programs of the Rate Setting Commission, and the broader planning efforts under P.L. 93-641 affected hospital investment behavior in Massachusetts? What changes in current regulatory policies and procedures might establish more binding constraints on hospital capital expansion?

Methodology

This study was designed to combine a statistically valid quantitative examination of capital investment among Massachusetts voluntary hospitals with a more qualitative case-study investigation of the factors that shaped the amount and composition of this investment. The design was developed because the combination of quantitative and qualitative analyses could yield complementary insights into hospital capital investment and the impact of Certificate of Need upon it that neither approach alone could provide. The quantitative analyses could offer a basic profile on the amount and composition of capital expenditure over time and on variations in the pattern of investment among hospitals of different teaching status and geographic location. Against this background, case-study analysis of selected institutions and specific investment projects could then offer information on the motivations underlying a hospital's capital program, the decision-making process surrounding capital expansion, and the consequences resulting from it. The conduct of case studies could also provide an opportunity to explore perceptions of CON and its effects held by individuals involved with hospitals in a variety of different capacities.

Development of the capital expenditure profile

The 95 short-term general voluntary hospitals in Massachusetts were stratified by Boston versus non-Boston location (with "Boston" defined by the boundaries of Health Services Area 4) and by teaching status: major teaching, lesser teaching, limited teaching, and nonteaching. Nonteaching hospitals were further stratified by bed size into those with 100 or fewer beds, 101 to 200 beds, and more than 200 beds. All teaching hospitals had at least 200 beds and therefore did not have to be further classified according to total bed complement. A random sample of 26 hospitals was then selected, using the technique of optimal allocation to determine the number of institutions to be drawn from each cell (Table 1).

TABLE 1: Sample composition and its determination using optimal allocation

Stratum	Stratum size (N_h)	Stratum standard deviation [1] (in Thousands) (s_h)	Sample size (n_h)
Major teaching	10		5
Boston	7	$7,100	3
Non Boston	3	8,200	2
Lesser teaching	7		4
Boston	5	8,900	3
Non Boston	2	6,700	1
Limited teaching	5		2
Non Boston	5	6,800	2
Nonteaching	73		15
Boston	18		4
≤ 100 Beds	6	130	2
> 100 Beds	12	1,240	2
Non Boston	55		11
≤ 100 Beds	14	1,800	2
101–200 Beds	18	1,900	2
> 200 Beds	23	5,900	7
Total	95		26

[1] Standard deviation of Certificate-of-Need approved capital expenditures 1972–76 as estimated from Massachusetts Determination of Need Program Information System

Optimal Allocation Formula (with equal cost of sampling for each stratum):

$$n_h = \frac{n N_h s_h}{\sum_{i=1}^{L} N_h s_h}$$

n = total sample size
n_h = sample size in the hth stratum
N_h = population in the hth stratum
s_h = standard deviation in the hth stratum

From public information available in the files of the Commonwealth of Massachusetts Rate Setting Commission, data were collected on the annual capital expenditures over the period FY 1967-76 made by each sample hospital in total and in the following categories: land, "plant" (including building, building improvements, and fixed equipment), and major movable equipment (MME). Data on asset values at historical cost and accumulated depreciation were also collected for Fiscal Years 1966, 1971 and 1976.

For all "projects" that involved total expenditures of $100 thousand or more (current dollars), the introduction of a major new ancillary service, or the addition of 4 or more beds, information was then obtained on the specific changes in hospital facilities and services that resulted from these investments: number and types of beds added or renovated, number of square feet added or renovated, ancillary service changes, etc. Data from the Rate Setting Commission, the Massachusetts Department of Public Health, the Massachusetts Determination of Need Program (as Certificate of Need is officially known in Massachusetts), and the sample hospital itself were combined to provide the necessary

detail. For projects approved by the Determination of Need Program, information was also obtained on changes in design, scope, and estimated cost that resulted from the process of CON review.

Data on the amount of capital expenditures, in total and for "plant" and MME considered separately, were used to examine general differences in capital investment by teaching status, geographic location, and time period. Because hospital accounting conventions recognize a capital expenditure only at the time the asset is first put into service, a hospital's capital expenditure profile is quite "lumpy" if examined on an annual basis. Therefore, total and average annual expenditures over the "pre-CON" period of 1967-71 versus the "post-CON" period 1972-76 were analyzed instead. In order to eliminate the effects of the considerable inflation in capital costs that occurred during the study period, all expenditures were converted to constant 1967 dollars using deflators derived from two indices employed by the Rate Setting Commission (RSC) to determine price-level depreciation: the Marshall and Stevens Class B Eastern Index for plant and an index for major movable equipment developed specifically for Massachusetts hospitals by American Appraisal Company at the request of the RSC.

Within the basic "picture" of hospital capital investment established by the expenditure data, "project" data were then used to determine more specifically the nature and composition of investment. Eight project categories were defined, and particular attention was focused on exploring variations across time and hospital type for "major bed projects" (i.e. new buildings or wings constructed by hospitals that included at least 20 inpatient beds), projects devoted to ancillary services and/or ambulatory care, and projects devoted to research. These project categories proved most important in institutional development strategy over the study period for all types of hospitals examined.

Conduct of case studies

Case studies were designed to elicit information on the course of institutional development among different types of Massachusetts voluntary hospitals by using a specific capital project or group of projects completed by an institution to focus discussion. This approach was chosen to assure that the same set of decisions and outcomes would be discussed with different "actors" in a hospital and to allow interviews to probe concrete details surrounding an actual capital investment as well as more general issues of

institutional development. All but 3 of the 26 sample institutions had either completed major capital projects during the study period or had submitted applications for such projects for CON review during this time and, therefore, were considered candidates for case-study. Ultimately, 9 institutions were selected representing the range of teaching status both in Boston and the rest of Massachusetts. In each case-study hospital, extensive interviews were conducted with the director or associate director, the chief financial officer or one of his principal assistants, a senior member of the board of trustees, the current or past president of the medical staff, and either the Chief of Radiology or Chief of Pathology. Selected other members of a hospital's administration, board, and medical staff who had played particularly important roles in the institution's development and who were identified during the course of discussion with the hospital director were interviewed as well. In order to gain some insight into the development of the three sample institutions that had made only limited capital investments during the study period, the director or associate director of two of these hospitals was interviewed as well.

Extensive interviews were also conducted with various members of the staff of the Massachusetts Department of Public Health to obtain information on the structure, function, and evolution over time of the Determination of Need Program and with staff of the Rate Setting Commission to clarify details of the prospective reimbursement system the Commission is developing for Massachusetts hospitals.

Findings

Both the capital expenditure analyses and case study findings revealed that Massachusetts voluntary hospitals experienced dramatic changes in the scale and scope of their operations during the period under study. Further, an appreciation of these changes and the forces underlying them proved essential to correctly interpreting the effects of Certificate of Need regulation upon hospital expansion. Therefore, the basic patterns of investment that have been characteristic of different types of Massachusetts hospitals are first summarized before the presentation of findings on the potential and actual impacts of CON.

Capital investment among Massachusetts voluntary hospitals

The period 1967-76 was one of enormous capital expansion among voluntary hospitals in Massachusetts. Net total capital asset values per bed of total complement at least doubled for all categories of institutions. Yet, average total bed complements increased by no more than 20 percent among any type of hospital (except nonteaching institutions with less than 100 beds) and actually declined slightly among nonBoston major teaching hospitals and among limited teaching hospitals. Major teaching hospitals in Boston led all other types of institutions in total capital investment, spending on average $23 million per hospital (constant 1967 dollars), $60 thousand per bed of total complement. Lesser teaching hospitals, both in Boston and elsewhere in the Commonwealth, showed the greatest change in asset values over the study period, increasing their net total capital assets almost 400 percent through average capital expenditures per hospital of $14 million (constant 1967 dollars), $44 thousand per bed. Nonteaching hospitals, on average, spent $4 million per institution, $25 thousand per bed.

Despite this universal expansionary behavior, the pattern of capital expenditures during the "pre-Certificate of Need" period 1967-71 versus the "post-CON" period 1972-76 proved distinctly

different as a function of hospital teaching status and bed size (Table 2). Among major, lesser, and limited teaching hospitals and hospitals with greater than 200 beds in general, total capital expenditures during 1972–76 in constant 1967 dollars were, on average, almost twice those during 1967–71; among nonteaching institutions, particularly those with fewer than 200 beds located outside of Boston, these patterns were reversed and expenditures "pre-CON" exceeded those "post-CON" by at least two-fold. When expenditures for physical plant versus major movable equipment were examined separately, those for plant exhibited the same patterns across time found for total expenditures. By contrast, expenditures for major movable equipment, the category most readily identified with hospital investment in "technology", were essentially constant across time, except among lesser teaching hospitals which showed a two-fold increase during 1972–76.

These patterns in total and plant expenditures, apparently associated with the presence of CON regulation, proved instead to be a function primarily of the completion dates of "major bed projects" and the synchrony in the construction of such facilities among similar hospitals (Table 3). Thus, the higher expenditures in 1972–76 among various categories of teaching hospitals largely resulted from the fact that these hospitals completed their major bed projects in 1972 or later. The higher expenditures in the "pre-CON" era among nonteaching hospitals arose because most of these institutions completed their major bed projects during 1967–71.

Differences in the completion dates of major bed projects reflected during the study period were found to have been present throughout the years since the conclusion of World War II. On average, Massachusetts voluntary hospitals constructed new inpatient facilities once every 14 years during this time. In general, construction peaked at different times for different types of institutions, largely as a function of particular environmental influences such as the ready availability of Hill-Burton funding to community hospitals during the early 1950's and the impact on teaching hospitals of the Medicare regulations requiring the replacement of ward care with semi-private accommodations.

Among virtually all types of Massachusetts hospitals, almost half of total capital expenditures during the entire study period was devoted to major bed projects, and case studies revealed that the 25 such projects completed by sample institutions played the pivotal roles in hospital development strategy and response to

TABLE 2: Average capital expenditures per hospital 1967–71 and 1972–76 by teaching status and geographic location—5-year sums, constant 1967 dollars in thousands

	Total		Total/Bed		Plant		Plant/Bed		M&E		M&E/Bed	
	1967–71	1972–76	1967–71	1972–76	1967–71	1972–76	1967–71	1972–76	1967–71	1972–76	1967–71	1972–76
Major teaching	$8,624	$11,833	$18.2	$26.8	$3,888	$8,006	$10.8	$19.2	$2,556	$3,231	$7.0	$8.1
Boston	8,425	14,788	24.1	37.3	5,048	9,856	14.4	24.7	3,203	4,140	9.2	10.6
Non Boston	2,420	4,987	4.6	9.0	1,215	3,887	2.3	6.3	1,053	1,110	2.0	2.3
Lesser teaching	4,831	9,448	14.7	28.9	3,553	6,788	10.7	20.8	987	1,721	3.0	5.2
Boston	4,024	9,834	13.4	30.9	2,758	6,770	9.2	21.4	895	1,788	2.9	5.5
Non Boston	6,847	8,484	18.2	23.9	5,548	6,835	14.7	19.3	1,209	1,562	3.3	4.3
Limited teaching	2,758	3,383	9.2	10.8	1,991	1,799	6.7	5.7	730	980	2.4	3.1
Nonteaching	2,513	1,888	15.8	9.4	2,088	1,078	13.0	5.8	416	455	2.8	2.5
Boston	2,238	1,314	13.8	10.4	1,758	824	11.1	7.8	437	442	2.5	2.5
≤ 100 Beds	748	1,483	11.6	19.0	662	1,334	10.2	16.9	86	143	1.4	1.9
> 100 Beds	2,980	1,224	14.9	6.1	2,308	588	11.5	3.0	612	593	3.1	2.9
Non Boston	2,804	1,810	16.5	9.1	2,170	1,161	13.8	5.2	410	480	2.7	2.5
≤ 100 Beds	1,229	357	15.5	3.9	1,029	62	12.8	0.7	210	144	2.9	1.7
101-200 Beds	3,980	1,551	26.1	9.8	3,522	814	22.7	4.5	419	516	3.0	3.2
> 200 Beds	2,384	2,897	9.5	11.8	1,807	2,089	7.1	8.6	530	609	2.3	2.5
All hospitals	$3,129	$3,273	$15.6	$13.0	$2,388	$2,286	$12.2	$ 8.3	$ 700	$ 887	$3.1	$3.3
Statistically Significant Differences[1]	p < .01	TEACH		None		None		None		TEACH TEACH × LOCATION		TEACH TEACH × LOCATION
	p < .05	None		TIME × LOCATION × BED SIZE		TEACH		TIME × LOCATION × BED SIZE		LOCATION BED SIZE		LOCATION

[1] Four-Way Analysis of Variance by Time Period (TIME), Teaching Status (TEACH), Geographic Location (LOCATION), and BED SIZE

TABLE 2: Total capital expenditures (in constant 1967 dollars) "Pre-CON" 1967–71 versus "Post-CON" 1972–78 among sample hospitals and fraction of total attributable to major bed projects

Hospital category	Total capital expenditures (in millions) "Pre-CON" 1967–71	Total capital expenditures (in millions) "Post-CON" 1972–78	Fraction of total attributable to major bed projects 1967–71	Fraction of total attributable to major bed projects 1972–78
Major teaching	$18.1	$32.4	0	.50
Lesser teaching	9.3	18.1	.57	.49
Limited teaching	3.8	4.6	0	.29
Nonteaching	50.2	33.7	.78	.38
All hospitals	$81.4	$88.8	.54	.44

changing market conditions. For all categories of voluntary hospitals, both before and after the introduction of CON, these projects provided the opportunity to greatly expand ancillary service "capacity" necessitated by rapid technological change and growing numbers of physicians entering practice with specialty and subspecialty training. Among nonteaching hospitals, in particular, the increase in the sophistication of the institution's product that resulted from the ancillary service expansion accompanying major bed project completion in the late 1960's represented a significant change in the hospital's capability to diagnose and manage complicated medical problems. Such projects provided the opportunity to introduce intensive care units, to inaugurate high-technology ancillary services, such as radiation therapy, and to greatly expand the scope of basic ancillary services such as radiology and laboratory. As a result, the necessity for community hospitals to transfer difficult cases to teaching centers was considerably diminished and a marked change in the structure of the hospital services market occurred.

With the decrease in referrals from community hospitals, teaching centers had to turn increasingly to their surrounding neighborhoods as a source of patients and redefined their mission to include provision of the full range of medical services as well as tertiary care. The major bed projects completed by major and lesser teaching hospitals were, therefore, largely motivated by the necessity to create the commanding institutional presence and to expand the primary care services considered essential to competing successfully for patients. The implementation of Medicare and Medicaid contributed greatly to the success of these efforts by providing third-party coverage to potential patient populations that previously had lacked the financial means to seek care in the private sector. While teaching hospitals also used such projects to marginally increase total bed complement, only non-

teaching hospitals in areas of rapid population growth significantly increased their bed size during the study period. The 25 major bed projects completed by sample hospitals resulted in the construction of more than 2200 new beds, but almost two-thirds of these beds replaced existing old ones. Hence, total bed complement increased by less than 800 beds.

Because most hospitals experienced only minimal increases in their total bed complements but greatly expanded the size and value of their physical plant, their resource "intensity" per bed increased considerably. The increased intensity, however, was found both prior to and following the introduction of Certificate of Need and simply reflected that fact that by the late 1960's and beyond, the provision of "state of the art" ancillary services and ambulatory care had become as necessary a part of a hospital's basic "capacity" as the hospital bed itself. A hospital lacking such services could not fill its beds because it could attract neither the necessary medical staff nor the requisite patient population.

During the study period, all types of voluntary hospitals constructed new inpatient facilities. Major and lesser teaching hospitals in addition significantly expanded their facilities devoted exclusively to ancillary services and research as these institutions enlarged their teaching and research commitments in response to greatly increased medical school enrollments and federal support for medical education and research.

While much of hospital capital investment during the study period was motivated by the desire of hospital decisionmakers to be responsive to the increased technological sophistication of current and potential staff physicians, decisions on the timing and scope of major investments were still primarily the province of hospital administrators and trustees. Except in teaching hospitals where major chiefs of service, such as the Chief of Medicine, played particularly influential roles in shaping institutional development, staff physicians were not the primary influences determining the amount or composition of a hospital's capital investment.

During the late 1960's and early 1970's, because third-party reimbursement assumed most of both the capital and operating costs associated with such investment, hospitals were largely unconstrained in their ability to expand. Some limited constraint on the overall scale and cost of major construction, however, was imposed for most hospitals by concerns over maintaining per-diem rates roughly comparable to those of other institutions in their market. Hospitals, therefore, had to exercise some caution

in the amount of debt they assumed. By the mid-1970's, the presence of the Determination of Need Program and charge control policies of the Rate Setting Commission, coupled with more restrictive reimbursement policies introduced by Medicare, began to introduce some further constraints, though not before most hospitals in Massachusetts had at least inaugurated if not completed capital expansion on a truly massive scale.

The extent of Certificate of Need coverage

During the period 1967 - 76, on average three-fourths or more of a hospital's total capital expenditures either were or would have been subject to CON review (Table 4). Of the expenditures devoted specifically to an institution's inpatient facilities, 80 percent or more would have or did require CON approval; by contrast, only 37 percent of hospital expenditures for major movable equipment either did or would have come under the aegis of CON.

Basically, all construction of new facilities and all projects involving the introduction or modernization of high-technology

TABLE 4: Average fraction of capital expenditures per hospital that either was or would have been subject to Certificate-of-Need review 1967-1976

	Total	*Plant*	*Major movable equipment*
Major teaching	.60	.73	.28
Boston	.66	.81	.28
	(.21)	(.10)	(.24)
Non Boston	.48	.54	.27
	(.39)	(.45)	(.06)
Lesser teaching	.83	.91	.46
Boston	.81	.88	.35
	(.04)	(.08)	(.31)
Non Boston	.89	.98	.46
Limited Teaching	.67	.86	.15
	(.14)	(.03)	(.13)
Nonteaching	.76	.85	.40
Boston	.73	.84	.44
≤ 200 Beds	.80	.85	.55
	(.17)	(.07)	(.24)
>200 Beds	.70	.87	.35
Non Boston	.76	.85	.39
≤ 200 Beds	.84	.93	.42
	(.06)	(.05)	(.19)
>200 Beds	.66	.74	.34
	(.33)	(.35)	(.22)
All hospitals	.74	.84	.37

( ) = standard deviation

specialized ancillary services fell under the authority of CON. Thus, all of the investments that have served as key elements in a hospital's strategy to make major changes in institutional image and/or product are subject to regulatory control, and Certificate of Need, therefore, has at least the theoretical potential to have a considerable influence on the direction of a hospital's future development. The minor renovations to existing facilities and purchase of major movable equipment associated with hospital investment in basic ancillary services, however, for the most part fall outside of the boundaries of CON authority, and whenever possible, at least in recent years, many hospitals have "packaged" even those few investments that should have been submitted for review in ways that avoided the CON ceiling. Thus, CON regulation has not been an effective mechanism for controlling this component of hospital capital investment and other approaches have more potential for limiting the amount of routine "technological investment".

The accomplishments and limitations of Certificate of Need regulation in Massachusetts

Previous investigators have commonly used "ultimate" outcome measures, such as the change in total hospital capital investment or investment per bed, to evaluate the effects of CON.[5,6,7] The patterns of hospital investment revealed by this study suggest, however, that such measures are not appropriate at least for several years following the introduction of regulation. The majority of hospital capital expenditures are attributable to infrequent large-scale "major bed projects" that have been built in different periods by hospitals of similar size and teaching status. At least in Massachusetts, the introduction of Certificate of Need regulation coincided with the conclusion of the peak of construction among small nonteaching hospitals and the beginning of the construction peak among teaching hospitals and large hospitals in general. Hence, differences in total capital expenditures across time display a spurious association with the introduction of CON that, in fact, was not related to the presence of regulation. Further, because all projects actually under construction when CON regulation began were exempt from review and because the construction of a major new facility takes several years, less than one-third of the expenditures actually made by sample hospitals during the "post-CON" period had in fact been reviewed by the program (Table 5). During the first two years "post-CON", virtually

TABLE 5: Average fraction of total capital expenditures per hospital falling under aegis of CON in 1972–76, 1972–73 and 1974–76 compared with average fraction actually approved by CON during each period

	Fraction of expenditures falling under aegis of CON 1972–76*	Fraction actually CON-approved 1972–76	Fraction of expenditures falling under aegis of CON 1972–73	Fraction actually CON-approved 1972–73	Fraction of expenditures falling under aegis of CON 1974–76	Fraction actually CON-approved 1974–76
Major teaching	.88	.27	.70	.01	.56	.44
Boston	.71	.28	.75	.01	.57	.37
	(.21)	(.45)	(.24)	(.02)	(.27)	(.44)
Non Boston	.56	.25	.57	0	.54	.54
	(.46)	(.15)	(.46)		(.44)	(.44)
Lesser teaching	.81	.40	.78	.11	.57	.53
Boston	.78	.28	.77	.14	.41	.41
	(.14)	(.61)	(.30)	(.25)	(.32)	(.32)
Non Boston	.87	.74	.80	0	.89	.89
Limited teaching	.52	.42	.02	.02	.61	.50
	(.38)	(.24)	(.02)	(.02)	(.38)	(.23)
Nonteaching	.53	.29	.32	.01	.43	.31
Boston	.52	.27	.39	0	.50	.24
≤ 200 Beds	.72	.22	.58	0	.81	.24
	(.15)	(.37)	(.52)	0	(.13)	(.40)
> 200 Beds	.15	.15	0	0	.23	.23
Non Boston	.53	.30	.30	.01	.41	.34
≤ 200 Beds	.51	.34	.22	0	.47	.38
	(.35)	(.40)	(.44)		(.37)	(.07)
>200 Beds	.53	.24	.40	.01	.33	.31
	(.40)	(.38)	(.50)	(.03)	(.43)	(.44)
All Hospitals	.57	.31	.38	.02	.46	.38

*Fraction of Expenditures that according to CON Regulations would be subject to review, including both expenditures that actually were reviewed and those that would have been if they had not been initiated prior to enactment of the CON statute in November, 1971

( ) = Standard deviation

none of the capital expenditures made by hospitals had been subjected to review. By 1974 and beyond, almost all expenditures that fell under the aegis of CON had in fact been reviewed and approved by the program. Nonetheless, during the 1974 - 76 period, the great majority of the expenditures that had been reviewed were attributable to projects approved during the first year of CON operation when the program lacked the rigorous review procedures and standards that characterized the function of the "mature" Certificate of Need process in 1976 and beyond (Table 6).

For these reasons, an ultimate outcome assessment was concluded to be inappropriate during the 1972 - 76 interval for which relevant data were available. Instead, this study evaluated CON effects using two measures of "intermediate" outcome: first, changes in project scope and design that resulted from the process of review, differentiating those achieved during the Program's "early" phase 1972 - 74 versus its "mature" period post-

TABLE 8: Amount and fraction of CON-approved expenditures in millions (current dollars) made during 1974–76 attributable to projects approved during 1972, by hospital teaching status

	Total expenditures 1974–76 that had been CON-approved	Amount of 1974–76 CON-approved total approved in 1972	Fraction of 1974–76 total approved in 1972
Major teaching	$31.3	$26.7	.85
Lesser teaching	17.5	13.4	.77
Limited teaching	6.5	2.2	.33
Nonteaching	23.5	16.8	.72
All hospitals	$78.8	$59.0	.75

1975, and second, changes in internal hospital investment strategy and interhospital relationships attributable to the presence of Certificate of Need.

Over the period 1972 to 76, only 9 percent of projects submitted to CON review by sample hospitals were denied certificates of need, and even many of these projects were eventually approved in modified form. However, as other investigators have also noted, a program's denial rate merely reflects the degree to which the review process permits negotiation over project details before a final decision is rendered.[8] The CON process in Massachusetts involves considerable interaction between program staff and applicant hospitals in the course of project evaluation. Consequently despite the low project denial rate, one fourth of all projects ultimately approved by the CON program were either significantly modified as a result of CON review or were approved only with attached conditions that required some change in existing hospital operations. The projects of all types of hospitals, including those of the major teaching institutions in Boston, experienced such modifications.

Throughout its existence, the CON program devoted its most careful analysis to projects involving acute care beds. During the early years of regulation, CON review concentrated on reducing the increase in a hospital's total bed complement that would result from the construction of a major bed project. The final CON-approved form of a project virtually always either included fewer new beds than an applicant had proposed or required that existing underutilized inpatient services, such as obstetrics or pediatrics, be closed as a condition of approval for the proposed project. During this phase of CON program operation, however, projects were usually approved at the total cost proposed by the applicant hospital, and the final costs of many completed facili-

ties often exceeded even these generous budgets by several million dollars before the Rate Setting Commission in 1975 became aware of the problem and helped to institute more rigorous financial analysis and control in the CON review process.

By late 1975, the scope of CON review had been expanded beyond a consideration of the number of beds proposed to include a critical analysis of every aspect of a project. Over the next three years, the CON Program began to develop the detailed standards and criteria required to evaluate "need" for various ancillary services and ambulatory care components as well as for acute care beds and established a basis for examining many dimensions of a project's scale and cost. During this mature phase of CON analysis, the final approved form of some projects was reduced by as much as two-thirds of that originally proposed, and in several instances the process of CON review and approval was able to eliminate several million dollars in proposed expenditures. Case-study interviews revealed that hospitals had not specifically "padded" proposed projects in order to provide opportunities for cuts by the CON Program, and these reductions therefore represent true savings attributable to the presence of regulation. No group of hospitals has been immune to such careful scrutiny, and even cherished projects of influential teaching hospitals were considerably diminished in scope and cost.

During both its early and mature stages, the Certificate of Need Program in Massachusetts also achieved considerable success in preventing the duplication of high-technology specialized ancillary services. In particular, for several years CON severely restricted the diffusion of CT scanners by approving only one scanner per HSA region outside of Boston until criteria for the appropriate use of CT scanning had been established and the technological development of the necessary equipment sufficiently stabilized to limit the high cost of rapid obsolescence. The CON Program was also able to reduce already existing redundancy in services such as radiation therapy by denying applications for new equipment submitted by hospitals lacking sufficient utilization to justify continuation and modernization of the service. In its mature form, the Massachusetts Determination of Need Program has also markedly changed the whole hospital investment "environment", in the view of all hospital decisionmakers. The construction of new facilities and the introduction or modernization of specialized ancillary services that have played so prominent a role in institutional development strategy are no longer the sole province of the individual hospital. Instead, the details of such projects must now be carefully negotiated with

other institutions in the hospital's market area and with the Health Systems Agency and the CON staff. As a result, internally hospitals have been forced to evaluate their appropriate roles and mission much more carefully and to develop more systematic and precise plans for capital expansion and replacement. Externally, interactions and interrelationships among hospitals have been greatly increased; hospital councils in many areas of Massachusetts have now become the arenas in which hospitals are attempting to develop the cooperative relationships that will diminish some of the pressures for product competition by allowing one institution to become the center for renal dialysis, another for obstetrics, a third for CT scanning, and so forth. These are negotiations of considerable delicacy because each hospital views its services as highly interdependent. Therefore, only the presence of external constraints imposed by CON, planning in general, and the emerging prospective reimbursement systems of the Rate Setting Commission has forced hospitals to alter the natural tendencies to maintain or acquire specialized services and facilities evidenced by hospital investment during the early years of the study period.

Nonetheless, Certificate of Need has not established a binding constraint on hospital capital expenditure. The CON process achieves only limited control over the acquisition of major movable equipment because the majority of such expenditures fall below CON review limits and hospitals have been successful in "unbundling" even some projects that should have been reviewed to circumvent the CON process. While CON reduced the scale of new construction, it has not prevented the addition of new physical capacity because the program now has no overall basis upon which to evaluate "need" for new replacement construction. Further, while CON has developed standards for acute-care beds that now permit precise calculation of the number of beds a hospital requires, the guidelines for the ancillary services and ambulatory care that now comprise such a major component of hospital capital expansion are much less specific. Finally, even mature CON analysis is based upon standards that define optimal efficient hospital practice on a service-by-service basis. Certificate of Need regulation provides no means of establishing an overall limit to the amount of resources an individual hospital or hospitals in general "should" commit to capital investment. Even the presence of a mature CON program, therefore, does not force an institution to choose among "necessary" projects for which expenditures can be justified on the basis of current or projected demand.

Implications and recommendations

These findings have significant implications for the conduct of future evaluations of regulatory impacts, for the ongoing operation of the Massachusetts Determination of Need Program and the prospective reimbursement system of the Rate Setting Commission, and for the use of "competitive" versus regulatory strategies in the effort to contain rising medical care costs.

Implications for the design of future evaluations of regulation

From the perspective of future evaluations of regulatory impacts, three particularly important lessons emerge from this study. First, regulation is imposed upon already existing patterns of behavior that in a realm such as capital investment with its long lags in planning and implementation are not likely to show an instantaneous response to a changed environment. Unless an effort is first made to understand these underlying patterns, one risks serious misinterpretation of the results generated by evaluation. Second, the implementation of regulation is an extremely complex process. The mobilization of requisite staff and the development of defensible procedures necessary to establish a rigorous and effective program take *years*, not months, even in the presence of strong political commitment to the importance of the effort. Therefore, it is simply unrealistic to expect that the effects of program action will begin to appear immediately after its enactment, especially if measures of ultimate outcome are used to determine these effects. Essential as it is to evaluate the impacts of the numerous government interventions that have been introduced in recent years, it is also important to be realistic in establishing a time frame within which results can be expected. Otherwise, one risks concluding that a program has been ineffective or worse, has been counterproductive when, in fact, it is simply too early to determine what its actual effects have been. Finally, much as measures of ultimate impact are eventually the ones that provide the true test of regulatory accomplishments, it is important to develop and use more intermediate measures of program

performance until final outcomes do begin to appear. Intermediate outcome measures are currently held in lower esteem than measures of ultimate outcome and usually require more detailed and costly data collection. Nonetheless, measures of intermediate outcome, such as those employed in this study, are the only ones that can provide the kind of interim assessment of program strengths and weaknesses necessary to improve regulatory performance.

Proposed modifications in current regulatory procedures

As judged on these intermediate outcome measures, the Determination of Need Program in Massachusetts has clearly been successful in creating an external mechanism that can assure the "necessity" of the investments being pursued by hospitals and limit the wasteful duplication of some facilities and services that previously accompanied each hospital's pursuit of its own individual interests. At present, however, the CON process in Massachusetts (and elsewhere in the country as well) is based on standards of absolute need and does not provide a means for allocating limited resources. Under present procedures, tradeoffs are not required, either among the worthy projects of a single institution or among those of the various hospitals serving a particular population. Hence, Certificate of Need does not now constrain capital investment in total and can therefore make only a limited contribution to the ultimate objective of restraining further increases in the consumption of real resources by the hospital sector.

The principal strategy now being advocated to impose a binding constraint on hospital capital expenditure is the introduction of a total expenditure "cap", either at the national level as Title II of President Carter's 1977 Hospital Cost Containment legislation proposed or in selected states, as New York for example, has considered. The crucial issues of how a fixed expenditure ceiling should be allocated across health services areas and how criteria could be developed to permit the approval of specific hospital capital projects within this "budget", however, have not been addressed in any detail. Given the difficult and time-consuming process that the development of defensible standards even for the review of individual projects proved to be in Massachusetts, it is hard to imagine how the necessary criteria for allocation of a fixed budget could be generated.

The patterns of hospital investment revealed by this study suggest, however, that a less comprehensive and therefore potential-

ly more feasible approach directed at the level of the individual hospital might be taken to more effectively constrain hospital capital expenditure in total. Such an approach would combine the development of a specific capital budget for each hospital to limit routine annual investment in major movable equipment and minor plant renovation with the establishment of more stringent criteria to guide evaluation for less frequent capacity and service expansion projects. The following specific modifications in current Certificate of Need and rate setting procedures are proposed as the first steps toward establishing more stringent limits on the amount of capital expenditure by Massachusetts hospitals:

- An annual budget for major movable equipment should be developed for each hospital on the basis of size, teaching status, and other relevant characteristics and not tied simply to the institution's own current MME asset value. The budget should be established through the Rate Setting Commission's prospective reimbursement system and once full payer participation in this system is secured, hospitals should be permitted to spend their budgets as they wish, submitting only projects involving high-technology ancillary services or new construction for CON review. Such a change would free the CON staff from reviewing projects that rarely have been modified significantly by the CON process, eliminate current incentives for hospitals to try to subvert CON review for these types of expenditures, and provide more time for the analysis of the types of projects that are the major vehicles used by hospitals to achieve significant changes in product and image.

- As part of the development of Health Systems Plans and the State Health Plan, criteria should be formulated to specify the grounds justifying replacement of existing facilities. In addition, more precise guidelines must be developed regarding expansion of facilities for ancillary services and ambulatory care. Such criteria and guidelines are essential to support more rigorous review of proposals for future major construction and hopefully would better enable Certificate of Need to counteract the environmental factors that stimulated and facilitated the enormous expansion in hospital physical plant since the mid-1960's.

- The Rate Setting Commission should reinstate its efforts to replace the current provision of historical cost depreciation with a "capital allowance" for each hospital that would include the costs of principal on current indebtedness and provide funding for future capital replacement and, if necessary, expansion. The de-

velopment of such an allowance was initially intended to be one important component of the prospective reimbursement system being established for Massachusetts hospitals. Recently, the Commission has retrenched from this position, feeling that it lacks sufficient information on capital formation to make a compelling argument for changing current reimbursement policies. The vital role that this and earlier studies have shown such policies to play in contributing to hospital capital expansion suggests that a capital allowance is an important component of an effective prospective reimbursement system and should be developed as initially planned.

The role of "competition" versus regulation in limiting increasing medical costs.

In recent years, numerous voices have been raised against the failings of "command and control" regulation, and more "market-oriented" solutions have been advocated as a better means of overcoming the problems to which regulation has been addressed.[9] In the health care sector, the development of health maintenance organizations (HMO's) is the most prominent of the "competitive" strategies now being promoted.[10] Because the financial viability of an HMO depends upon careful control of the costs of hospital care rendered its enrollees, HMO's are sensitive to the price of hospital services in a way that individuals with comprehensive insurance coverage are not. Hence, if HMO's gain wide acceptance, hospitals may be forced to compete on the basis of price as well as product.

Nonetheless, it must be appreciated that at present HMO's still cover a small fraction of the population, that most physicians still are in fee-for-service private practice, and that the number of physicians is still increasing. It is widely recognized that physician utilization of hospital services is a major contributor to the total level of hospital costs and that the increasing number of physicians therefore has ominous implications for future increases in the cost of hospital care and indeed of medical care in general. The findings of this study have demonstrated, however, that while hospitals have expanded service and facility "capacity" in response to the "needs" of current and potential medical staff, the major decisions involving the timing and scale of expansion reside with hospital administrators and trustees. Therefore, capital expenditure and rate regulation designed to constrain the future options of hospital decisionmakers has the potential to exert considerable influence on physician behavior as well. Hence, the

continuation and indeed strengthening of existing hospital regulation offers an important instrument for limiting the future cost impacts of the growth in the supply of physicians.

Given the nature of the health services "market", therefore, the fostering of "competition" and the further refinement of regulation should be viewed not as alternative strategies but rather as complementary mechanisms to introduce some economic discipline into a sector that has largely operated without it.

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16. Abstract

This study examines hospital capital investment among Massachusetts short-term general voluntary hospitals between 1[illegible] and 197[illegible], and assesses the impact of Certificate of Need (CON) regulation. A profile of capital expenditures for fiscal years 197[illegible] - 197[illegible] was developed from Massachusetts Rate Setting Commission data for [illegible] sample hospitals, stratified by teaching status and Boston versus non-Boston location. Case studies were conducted in nine sample hospitals to explore the determinants and consequences of major capital projects undertaken by the institution. Enormous capital expansion took place from 197[illegible]-79. Hospitals in areas of rapid population growth significantly increased their bed size; other hospitals replaced or modernized inpatient facilities, and expanded ambulatory care capacity. All hospitals significantly expanded their ancillary service capacity. With respect to the impact of CON regulation, the evidence revealed that by 197[illegible] and beyond, CON review had reduced all dimensions of project scale and cost by as much as two-thirds of that originally proposed.

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Marianne Miller, NCHSR Project Officer, 3[illegible]-[illegible]43

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